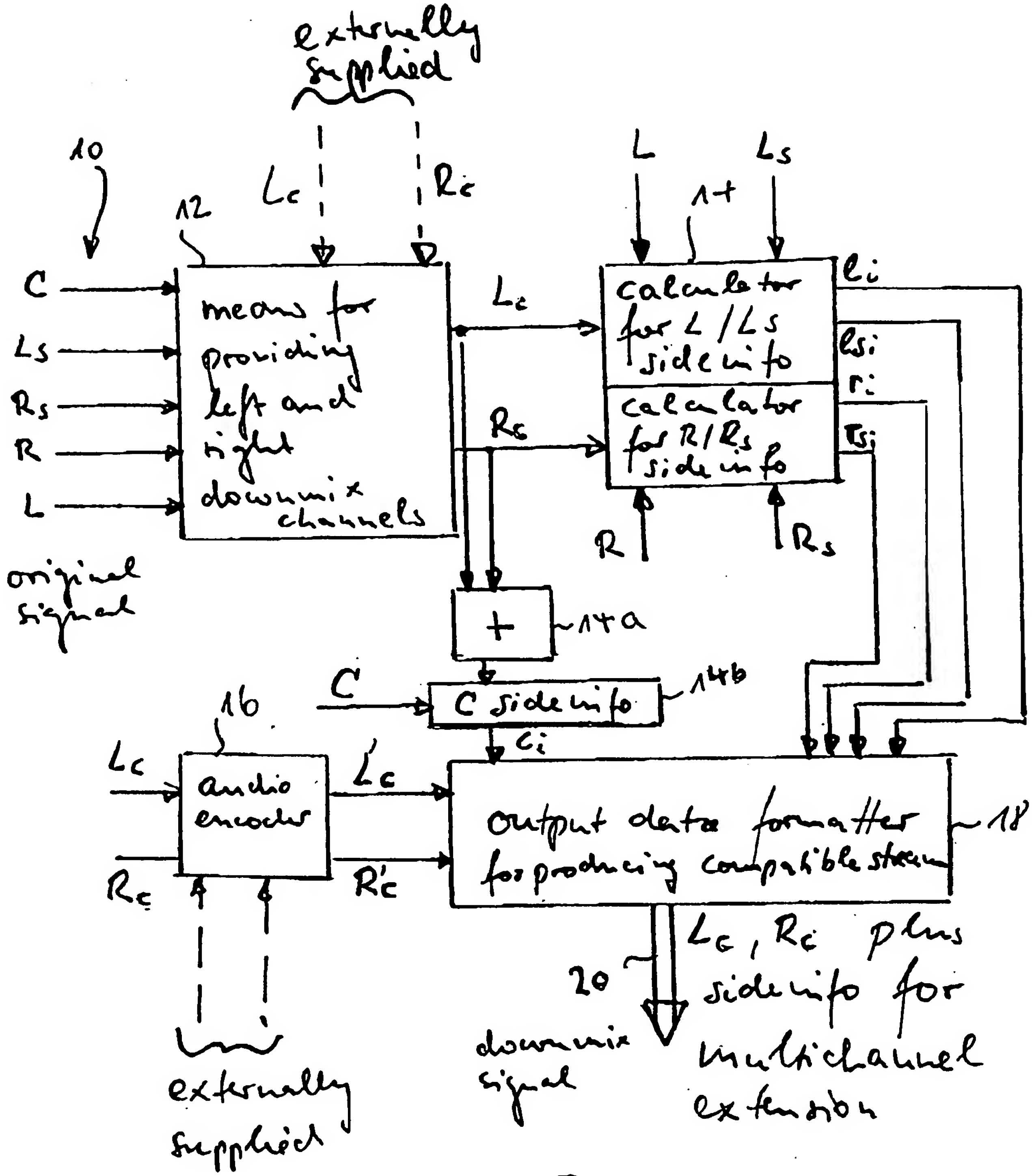


Fig. 1A (Encoder)

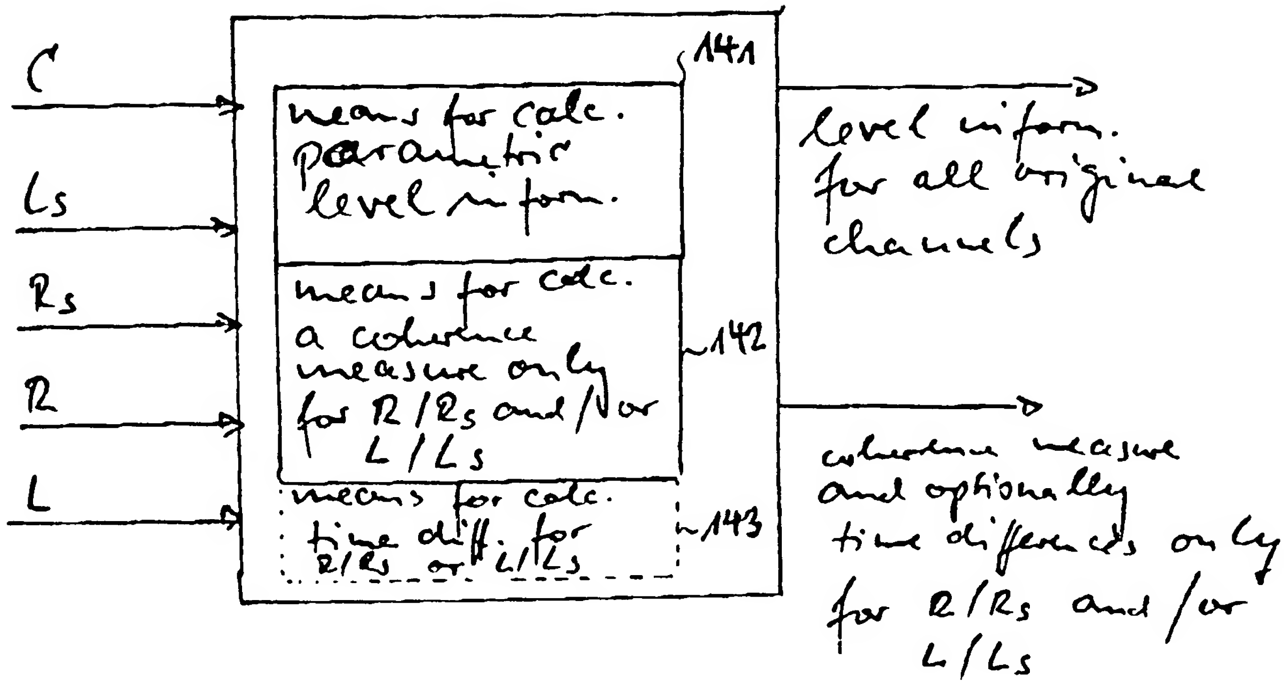

C
Ls
Rs
R
L
means for calc. parametric level inform.
141
means for calc. a coherence measure only for R/Rs and/or L/Ls
142
means for calc. time diff. for R/Rs or L/Ls
143
level inform. for all original channels
coherence measure and optionally time differences only for R/Rs and/or L/Ls

Fig. 1B

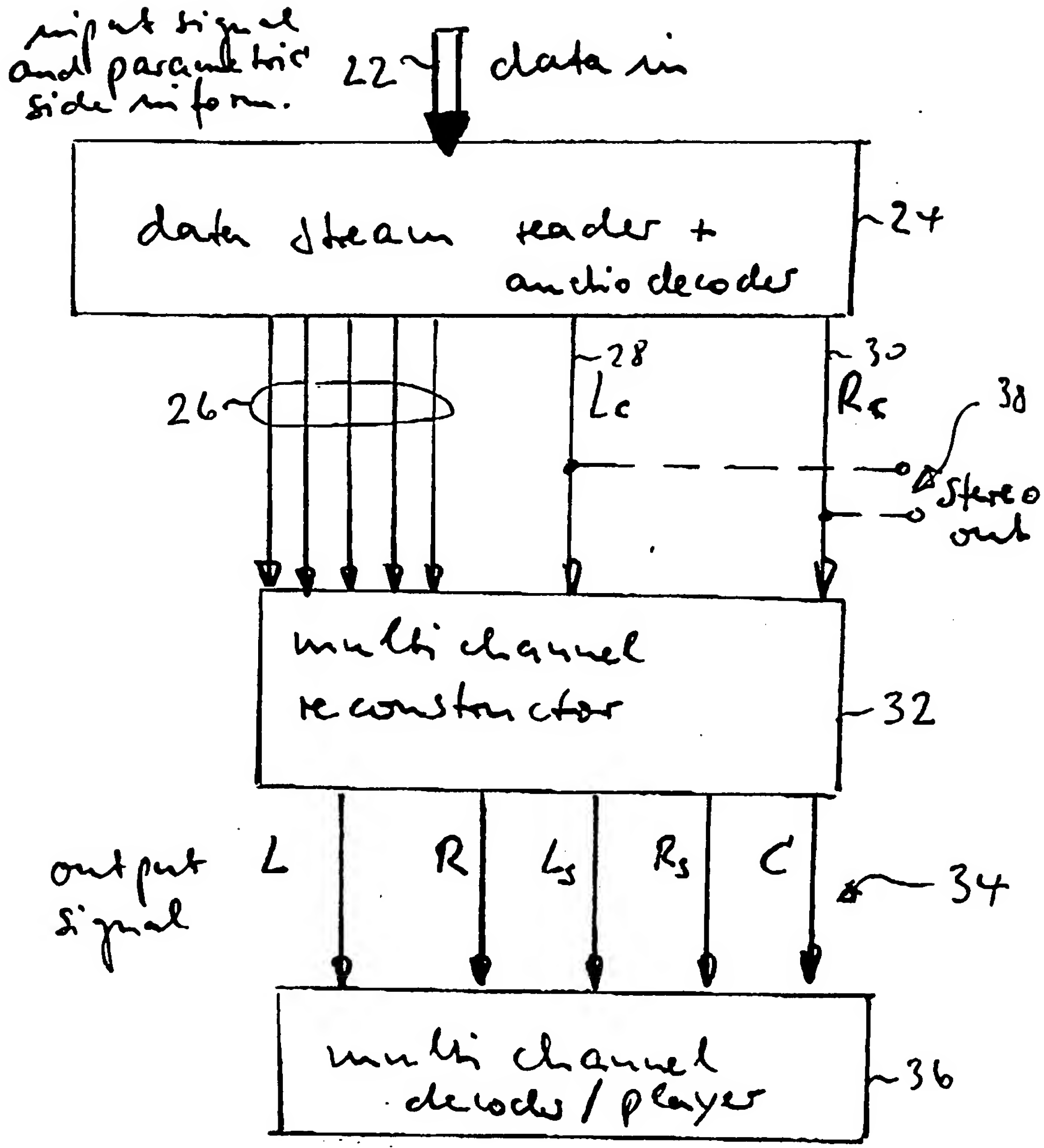


Fig. 2A (Decoder)

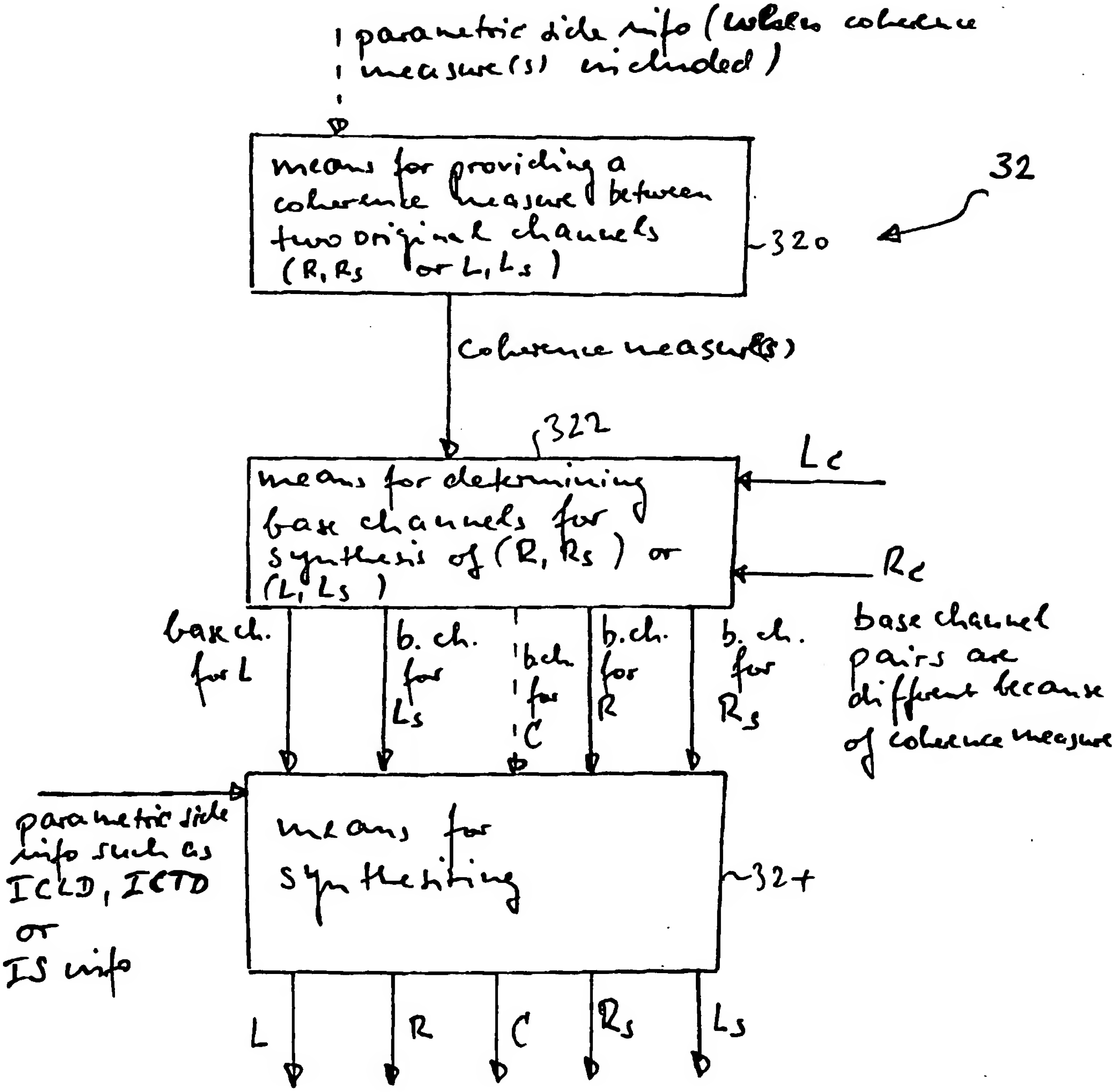

parametric side info (where coherence measure(s) included)
means for providing a coherence measure between two original channels (R, Rs or L, Ls)
320
32
coherence measure(s)
322
means for determining base channels for synthesis of (R, Rs) or (L, Ls)
Lc
Rc
base ch. for L
b. ch. for Ls
b.ch. for C
b.ch. for R
b. ch. for Rs
base channel pairs are different because of coherence measure
parametric side info such as ICLD, ICTD or IS info
means for synthesizing
324
L
R
C
Rs
Ls

Fig. 28

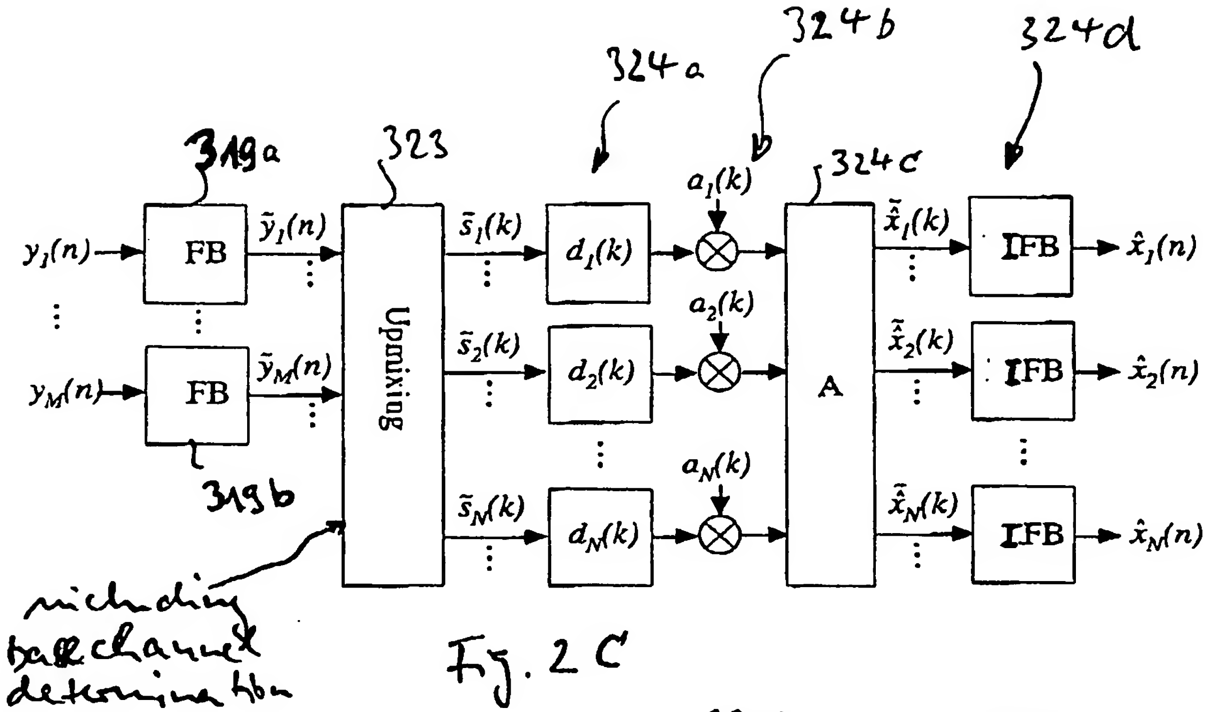

324b
324d
324a
319a
323
324c
FB
FB
Upmixing
A
IFB
IFB
IFB
319b
including base channel determination

Fig. 2C

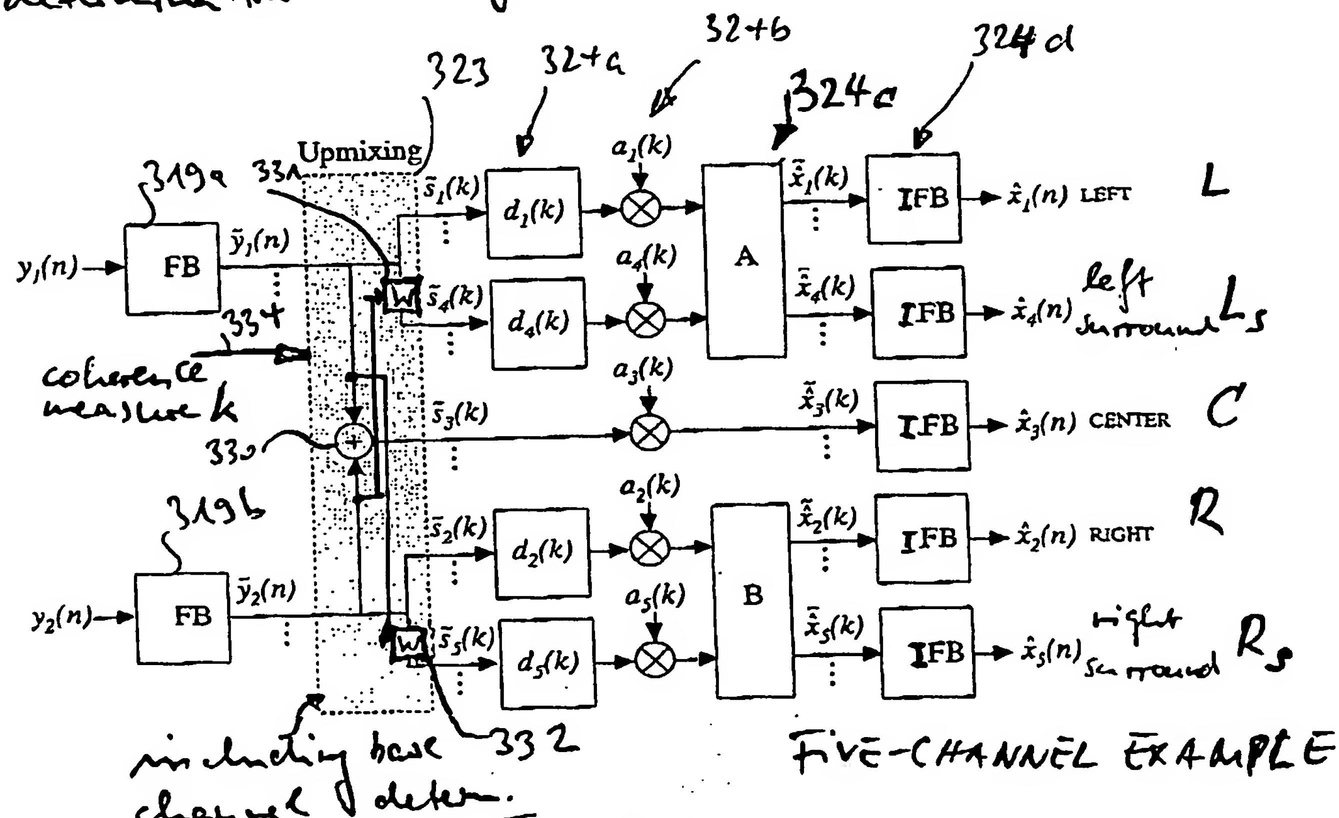

324b
324d
323
324a
324c
Upmixing
319a
331
FB
334
coherence measure k
330
319b
FB
W
W
A
B
IFB
IFB
IFB
IFB
IFB
LEFT
L
left surround
L_s
CENTER
C
RIGHT
R
right surround
R_s
332
including base channel determ.
FIVE-CHANNEL EXAMPLE

Fig. 2D

means for determining coherence measure

$$cc(x,y) = \frac{\sum x_i \cdot y_i}{\sqrt{\sum_i x_i^2} \cdot \sqrt{\sum_i y_i^2}}$$

cc: coherence measure (cross correlation)

x_i : sample at time instance i of first original channel

y_i : sample at time instance i of 2^{nd} original channel

Fig. 2E (encoder side)

base channel for left (L) output channel : $l \hat{=} L_c$

base channel for rear left (L_s) output ch. : $l + \alpha \cdot r \hat{=} L_c + \alpha \cdot R_c$

$$k = cc(l, l + \alpha \cdot r)$$

$$\frac{\sum l \cdot [l + \alpha \cdot r]}{\sqrt{\sum l^2} \cdot \sqrt{\sum [l + \alpha \cdot r]^2}} = k$$

$$-1 \leq k \leq 1$$

α : weighting factor (to be determined)

l : left input channel

r : right input channel

k : coherence measure (time-varying, transmitted as side information)

$$\alpha_{1/2} = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

wherein: $L = \sum l^2$ $\quad R = \sum r^2$ $\quad C = \sum l \cdot r$, and

$A = C^2 - k^2 LR$ $\quad B = 2LC(1 - k^2)$ $\quad C = L^2(1 - k^2)$.

Fig. 2F (decoder side)

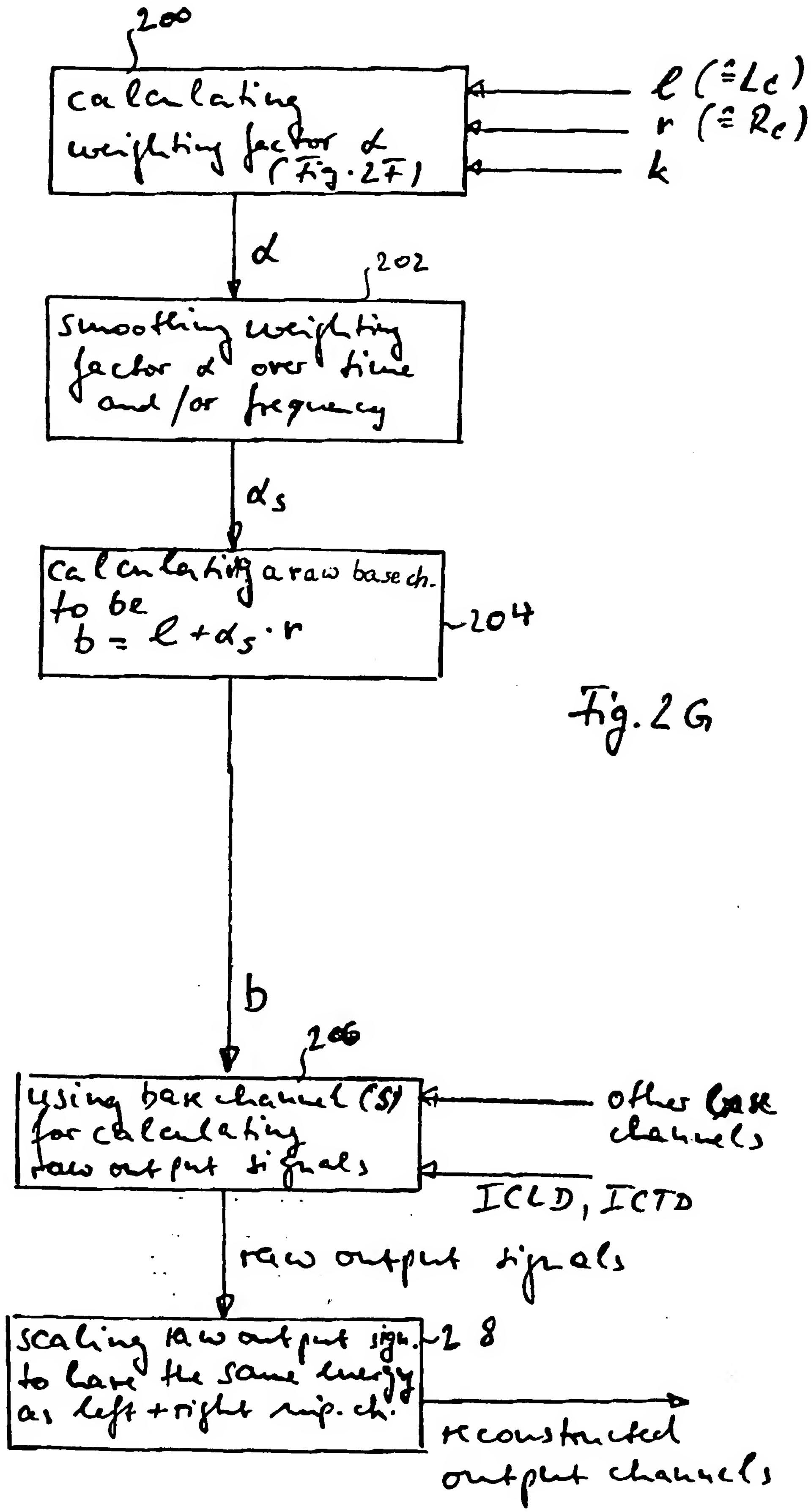

200
calculating weighting factor α (Fig. 2F)
l ($\hat{=} L_c$)
r ($\hat{=} R_c$)
k
α
202
smoothing weighting factor α over time and/or frequency
α_s
calculating a raw base ch. to be $b = l + \alpha_s \cdot r$
204
b
206
using base channel (s) for calculating raw output signals
other base channels
ICLD, ICTD
raw output signals
scaling raw output sign. to have the same energy as left + right inp. ch.
208
reconstructed output channels

Fig. 2G

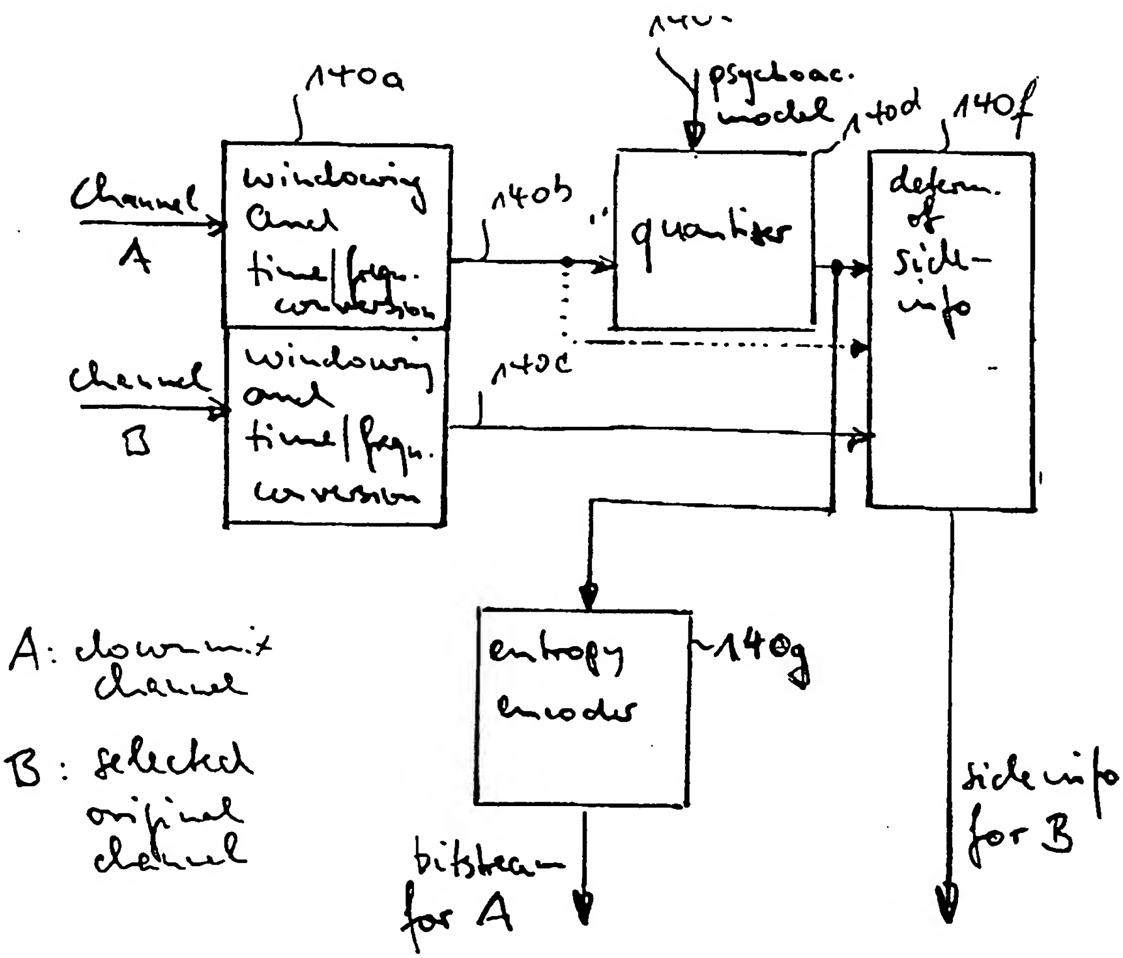

140a
140e
psychoac. model
140d
140f
Channel A
windowing and time/freq. conversion
140b
quantizer
defom. of side-info
channel B
windowing and time/freq. conversion
140c
A: downmix channel
B: selected original channel
entropy encoder
140g
bitstream for A
side info for B

Fig. 3A

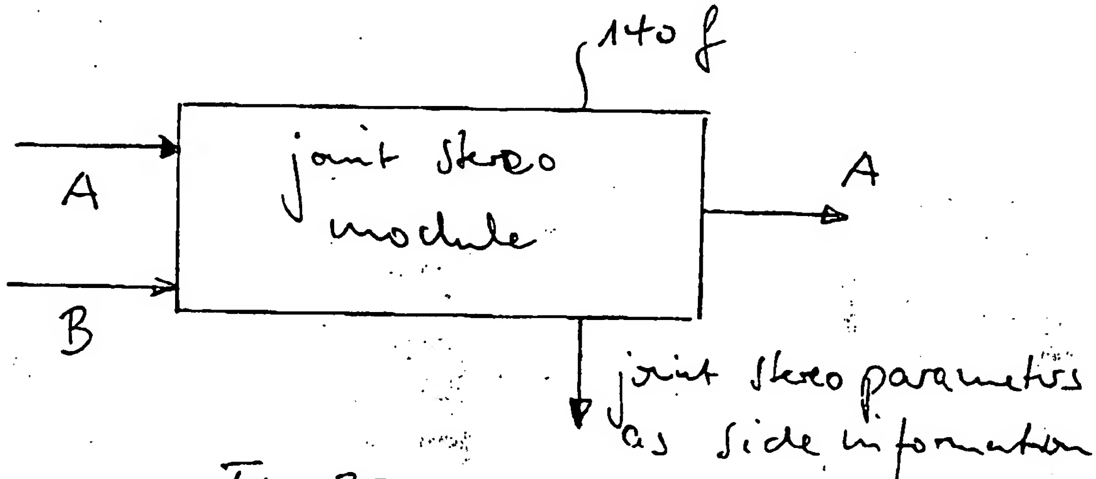

140f
A
B
joint stereo module
A
joint stereo parameters as side information

Fig. 3B

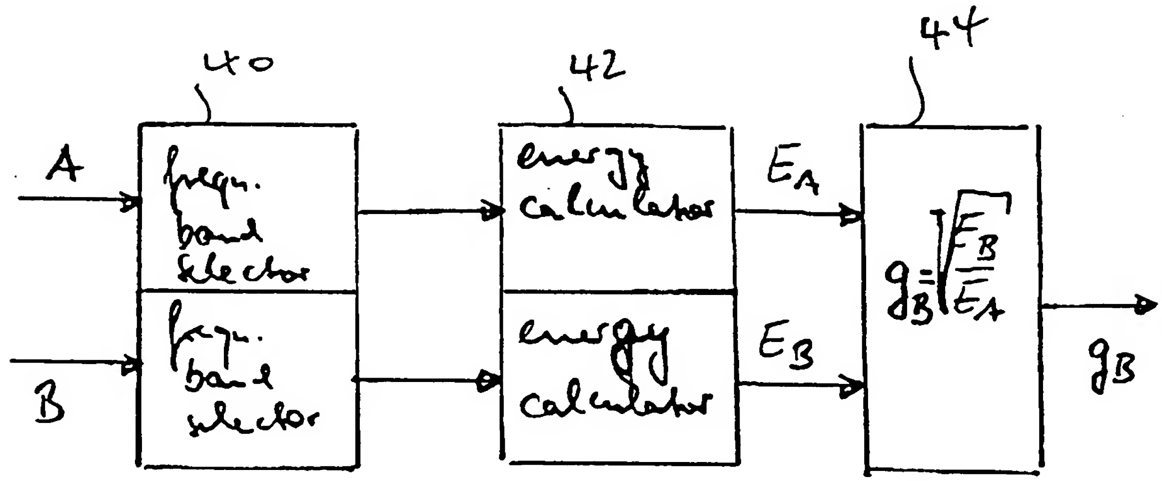


Fig. 4 (encoder side)

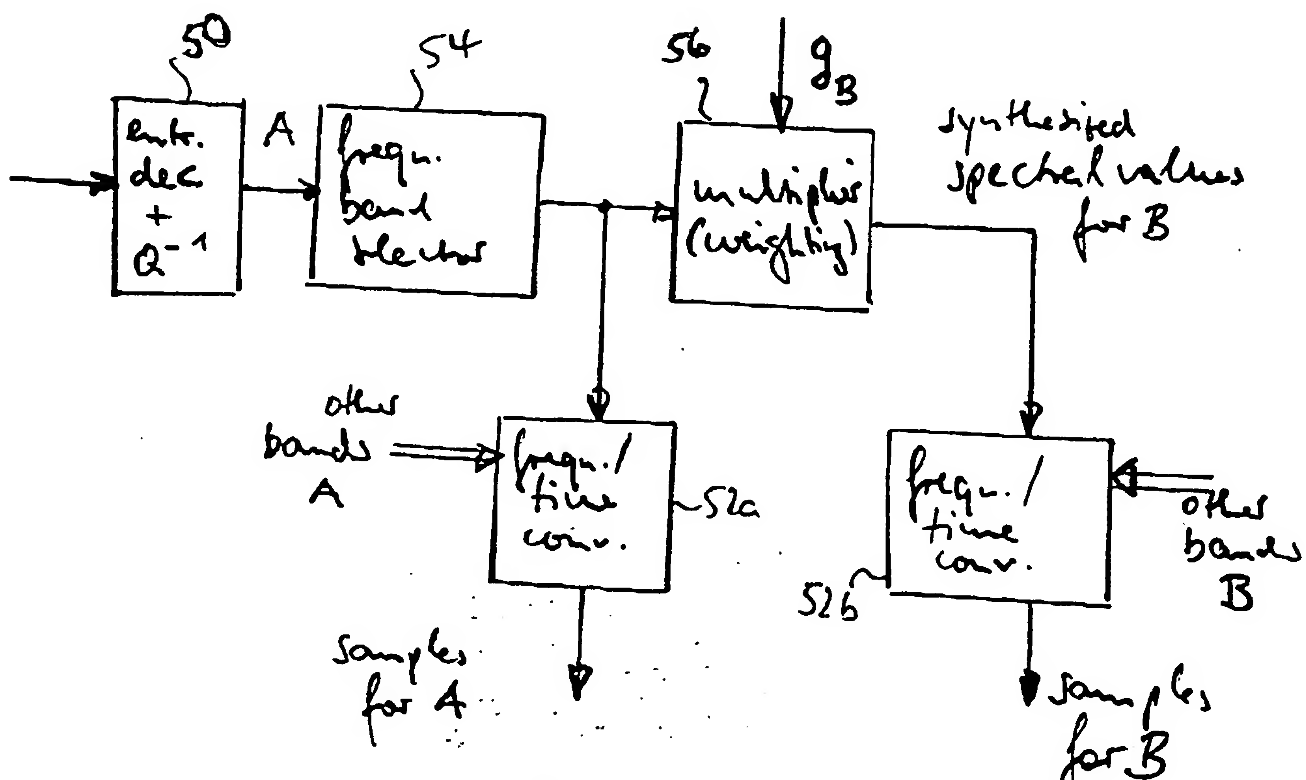


Fig. 5 (decoder side)

DOWNMIX

L_c	$= t \cdot [L + a \cdot L_s + b \cdot C]$
R_c	$= t \cdot [R + a \cdot R_s + b \cdot C]$

all signals are time domain signals

$a, b, t \leq 1$

preferred: $a = b = 0{,}7$

or: $a = 0{,}5$; $b = 0{,}7$

Fig. 6

ch. side info	CHANNEL B side infos / parameters for:	CHANNEL A are determined using:
l_i	L	L_c
ls_i	L_s	L_c
r_i	R	R_c
rs_i	R_s	R_c
c_i	C	$L_c + R_c$

Fig. 7

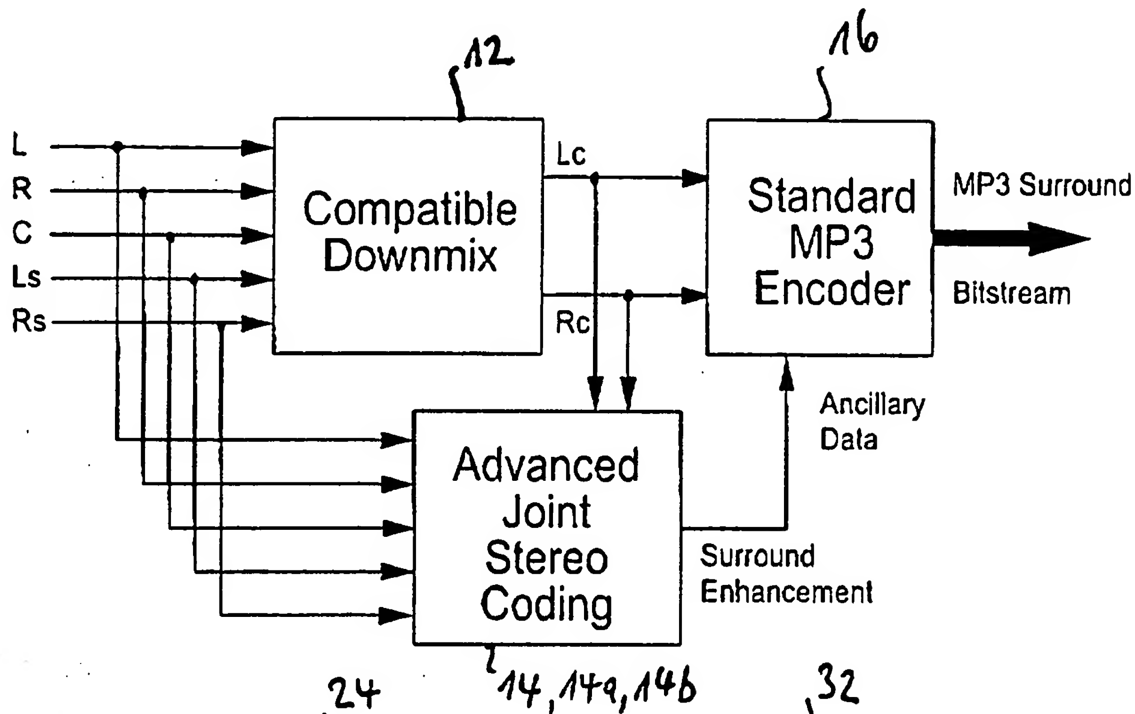

12
16
L
R
C
Ls
Rs
Compatible Downmix
Lc
Rc
Standard MP3 Encoder
MP3 Surround
Bitstream
Ancillary Data
Advanced Joint Stereo Coding
Surround Enhancement
14, 14a, 14b

Fig. 8

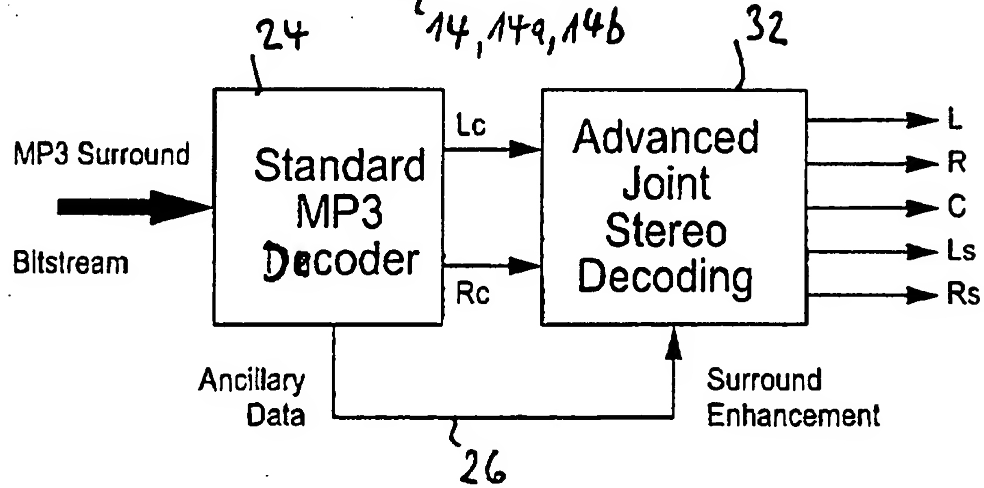

24
32
MP3 Surround
Bitstream
Standard MP3 Decoder
Lc
Rc
Advanced Joint Stereo Decoding
L
R
C
Ls
Rs
Ancillary Data
Surround Enhancement
26

Fig. 9

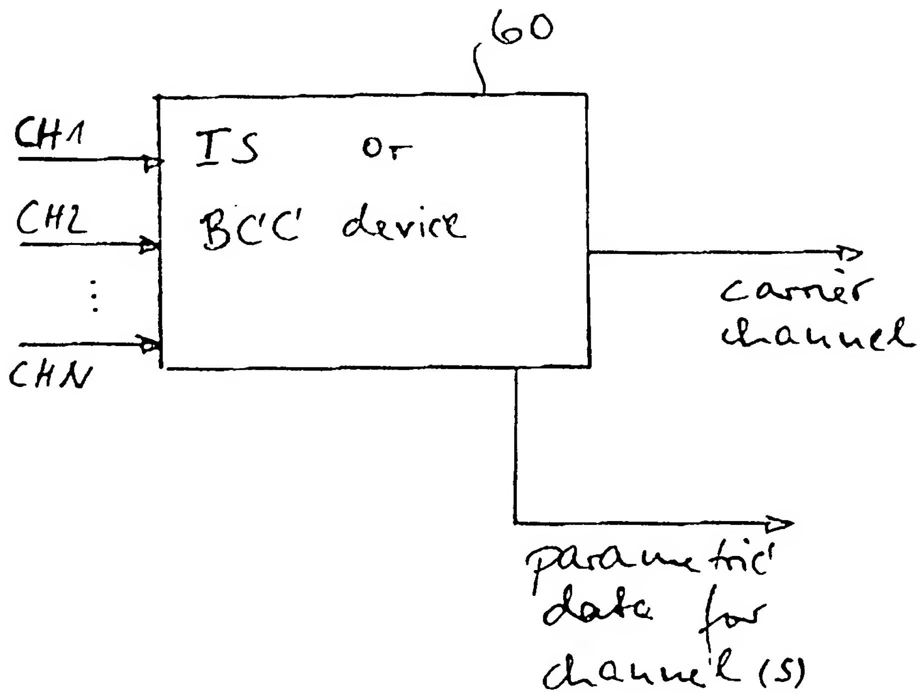


Fig. 10 (Prior Art)

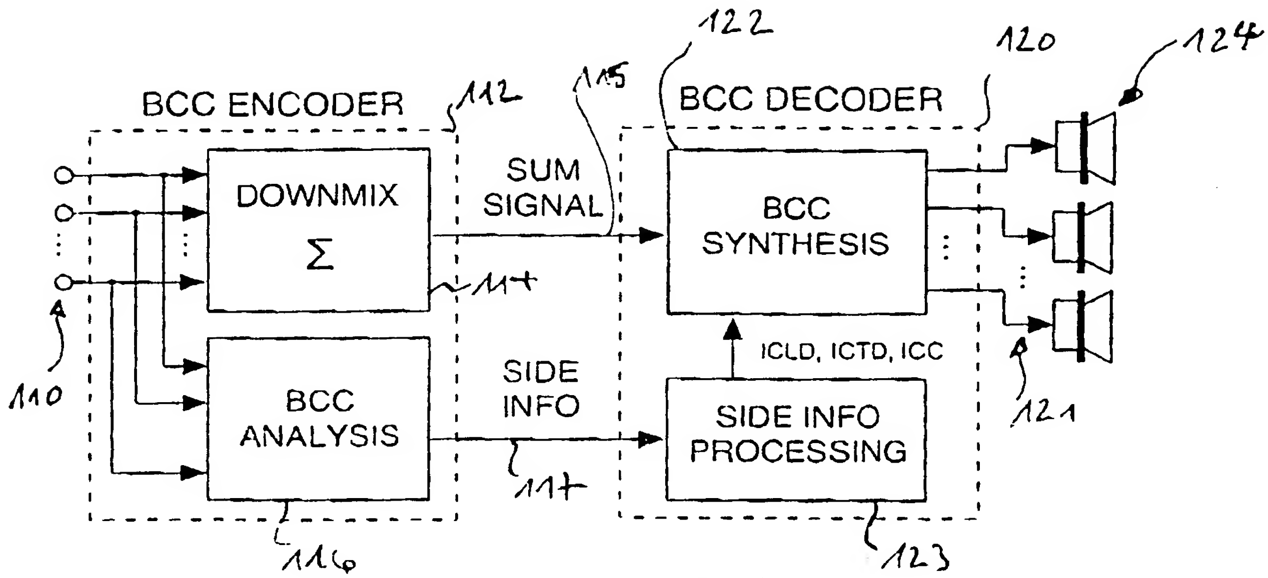


Fig. 11 (Prior Art)

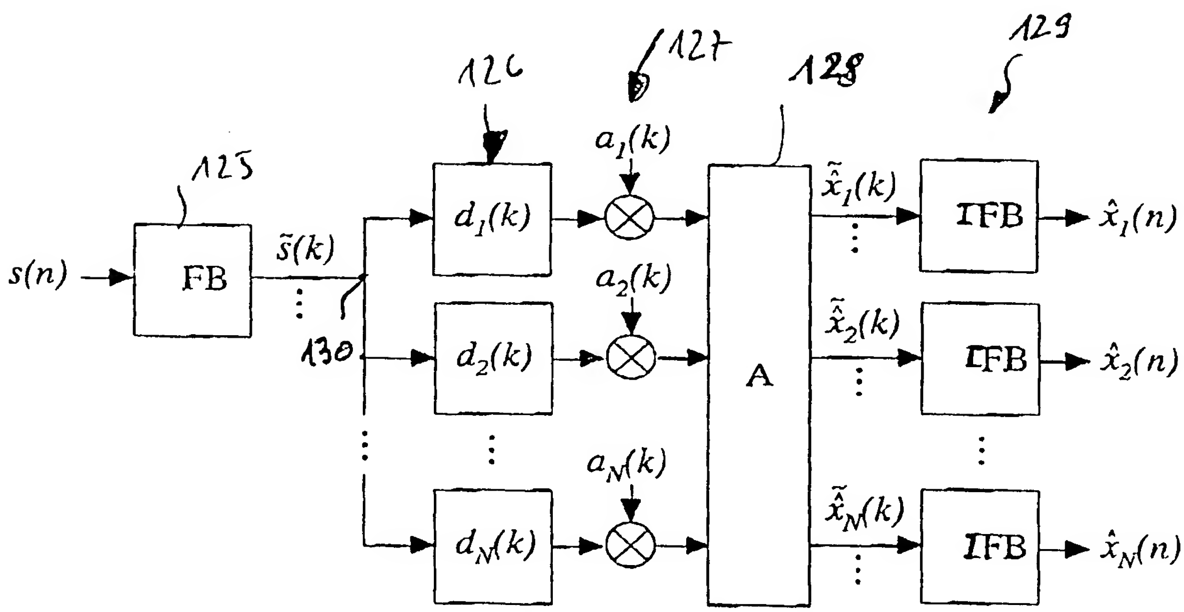


Fig. 12 (Prior Art)

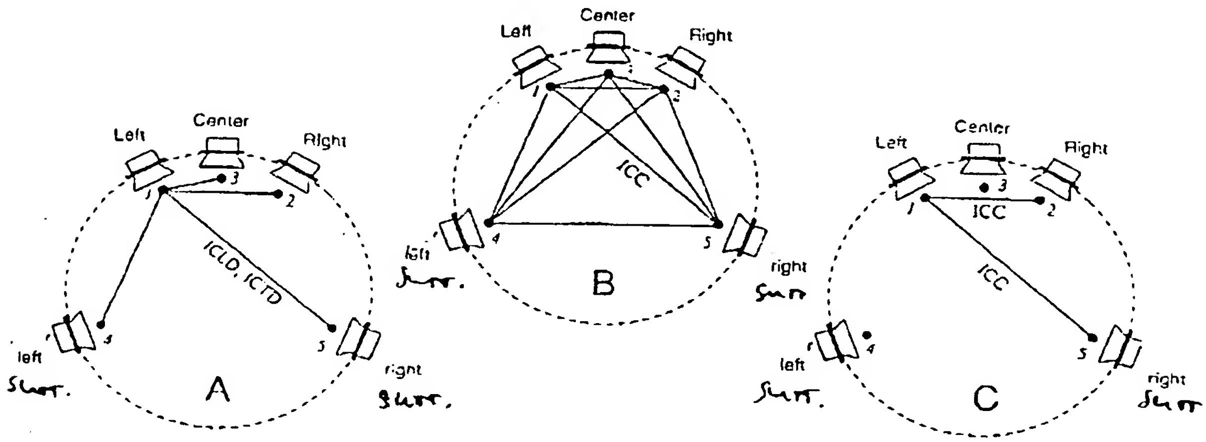


Fig. 13 (Prior Art)

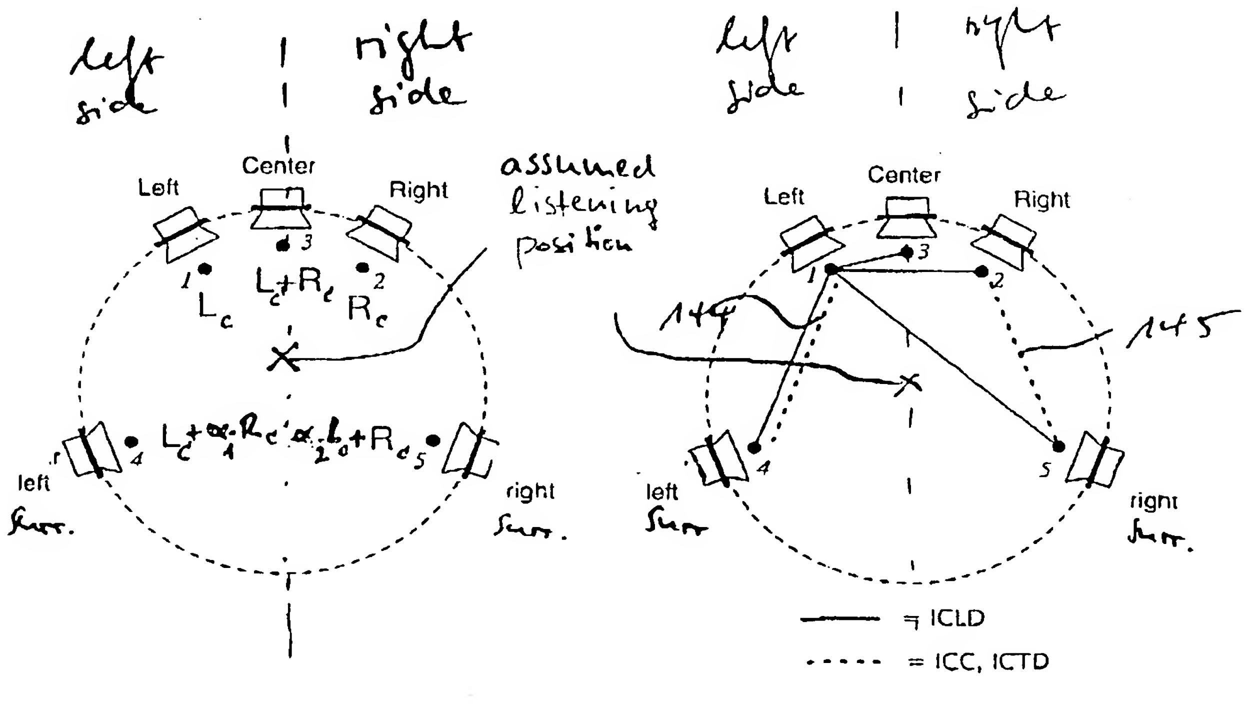
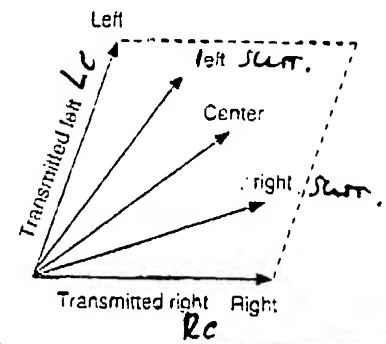


Fig. 14A

Fig. 14B

Fig. 15 A

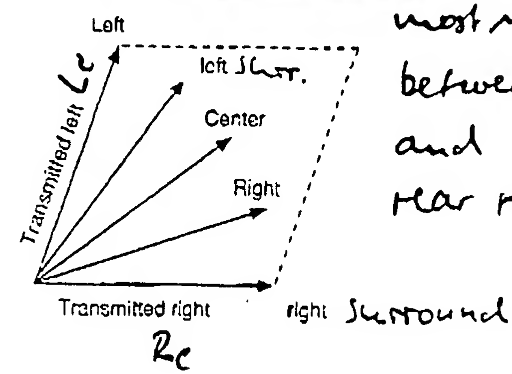
Base channels:
left = L
right = R
center = L + R
rear left = L + 0.7R
rear right = R + 0.7L



most independence between front left and front right

Fig. 15 B

Base channels:
left = L
right = R + 0.7L
center = L + R
rear left = L + 0.7R
rear right = R



most independence between left and rear right